CEREAL SCIENCE today

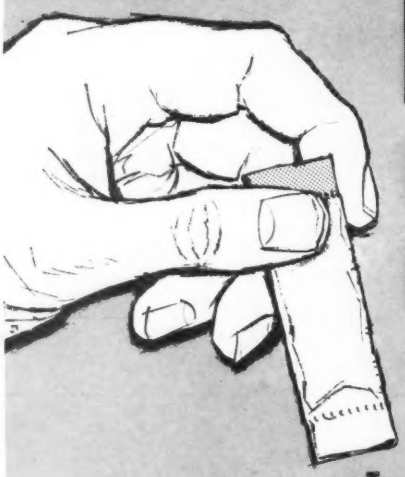
35c PER COPY

JANUARY 1960 VOLUME 5 • NUMBER 1

AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

TOXICITY STUDIES
SOYBEANS
HARD RED SPRING WHEAT LABORATORY



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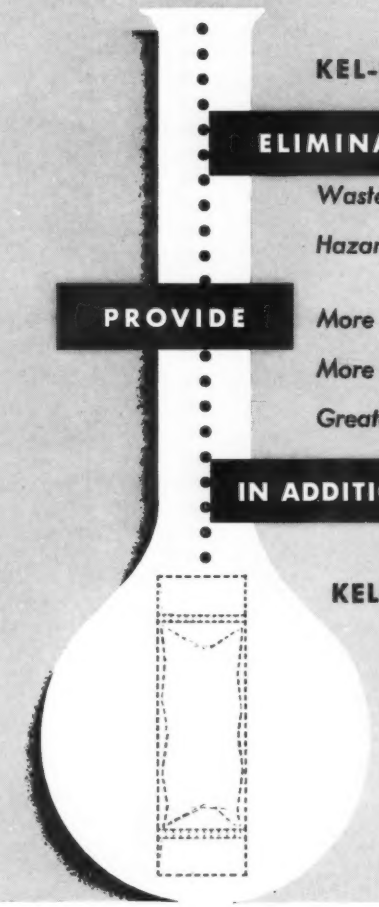

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The Roche Review Of Enrichment Requirements

for Cereal Grain Foods in the United States

All figures represent milligrams per pound

PRODUCT	Thiamine (B_1)		Riboflavin (B_2)		Niacin		Iron	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Enriched BREAD or other *baked* products	1.1	1.8	0.7	1.6	10.0	15.0	8.0	12.5
Enriched FLOUR[1]	2.0	2.5	1.2	1.5	16.0	20.0	13.0	16.5
Enriched FARINA	2.0	2.5	1.2	1.5	16.0	20.0	13.0	*
Enriched MACARONI & NOODLE Products[2]	4.0	5.0	1.7	2.2	27.0	34.0	13.0	16.5
Enriched CORN MEALS	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched CORN GRITS[3]	2.0	3.0	1.2	1.8	16.0	24.0	13.0	26.0
Enriched Milled WHITE RICE[4]	2.0	4.0	1.2**	2.4**	16.0	32.0	13.0	26.0

* No maximum level established.

** The requirement for vitamin B_2 is optional pending further study and public hearings because of certain technical difficulties encountered in the application of this vitamin.

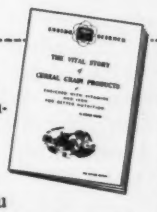
1 In enriched self-rising flour, calcium is also required between limits of 500-1500 mg. per pound.

2 Levels allow for 30-50% losses in kitchen procedure.

3 Levels must not fall below 85% of minimum figures after a specific test described in the Federal Standards of Identity.

4 The Standards state that the rice, after a rinsing test, must contain at least 85% of the minimum vitamin levels. The Governments of Puerto Rico and the Philippines also require this rinsing test. If the method of enrichment does not permit this rinsing requirement to be met, consumer size packages must bear the statement, "Do not rinse before or drain after cooking." Rice enriched by the Roche method will meet the rinsing test. The South Carolina law does not require a rinsing test on packages less than 50 pounds, as the rice in small packages is presumed to be sufficiently clean.

The maximum and minimum levels shown above for enriched bread, enriched flour, enriched farina, enriched macaroni, spaghetti and noodle products, enriched corn meal and corn grits and enriched rice are in accordance with Federal Standards of Identity or State laws. Act No. 183 of the Government of Puerto Rico requires the use of enriched flour for all products made wholly or in part of flour, including crackers, etc.



Brief, authoritative stories about the enrichment of many cereal grains have been gathered into a booklet which you may have for the asking. Just send your request for "The Vital Story of Cereal Grain Products" to the Department of Education, Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey.

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LETTERS to the editor

Russian Baking Practices

DEAR SIR:

In K. L. Fortmann's description of the technology of the continuous dough processing, he makes a statement that Russia has over 200 continuous mixers in operation. As written, I believe that this is misleading. The continuous mixing systems in Russia are not as Fortmann describes. It is true that they are working on a continuous sponge fermentation process with a remix step and then a continuous dough fermentation process, but I saw no evidence that they are mixing all ingredients together at one time. My reaction to their research and the processes that I saw was that they are not as advanced as the American continuous dough making system and not as advanced as the European continuous dough making systems which are now in operation.

The Russians are extremely interested in the process that we are using and expressed surprise at its wide use in industry in the United States. At their request, I sent to the Central Scientific Institute for the Bread Baking Industry reprints in this area in order to emphasize my point that the continuous breadmaking system is no longer a laboratory curiosity in the United States.

ROBERT A. LARSEN

The Pillsbury Company
Minneapolis, Minnesota

STORAGE

of Cereal Grains and Their Products

Edited By
J. A. Anderson and A. W. Alcock

1954 • 6x9 • x+515 pp.
90 illustrations, 52 tables,
1120 references

PRICE: $11.00

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1955 University Ave.
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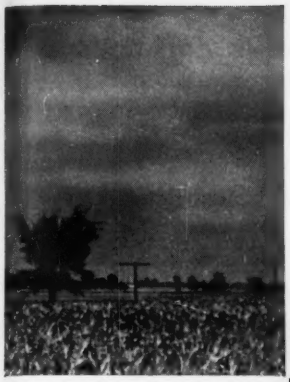
VOLUME 5 • NUMBER 1 • JANUARY 1960



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COVER: Kjeldahl room in Continental Baking Company's new million-dollar laboratory at Rye, New York.

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CEREAL SCIENCE Today is published ten times per year (monthly except June and August) by the American Association of Cereal Chemists, from 500 South 5th Street, Minneapolis 15, Minnesota. Editorial, Circulation and Advertising Headquarters: 1955 University Avenue, St. Paul 4, Minnesota. Entered as second class matter at the post office at Minneapolis, Minn., under the Act of August 24, 1912.

The American Association of Cereal Chemists assumes no responsibility for the statements and opinions advanced by contributors to its publications. Views expressed in the editorials are those of the editors and do not necessarily represent the official position of the American Association of Cereal Chemists.

Subscription rates: 1 year, $3.00; 2 years, $5.00; 3 years, $7.00. Foreign postage: $1.00 per year extra. Back issues available on request. Single copies: 35 cents.

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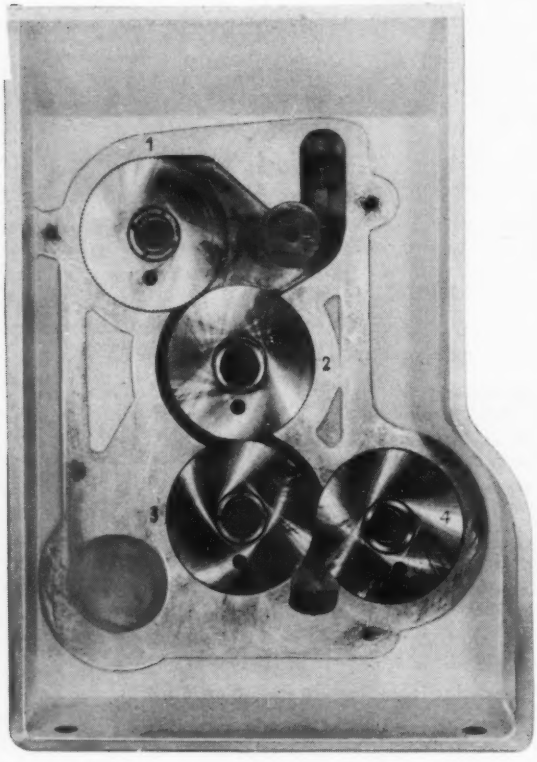

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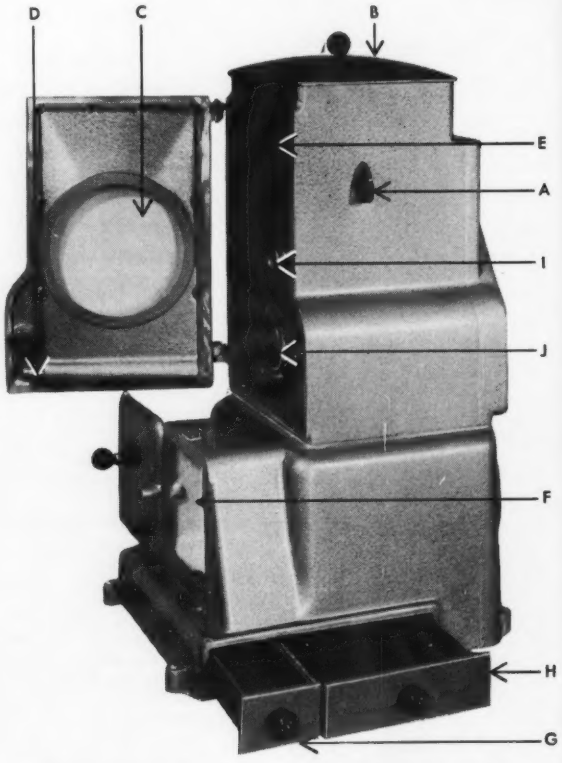

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Editorial

It is probably correct to say that most chemists do not devote much of their time to acquainting the general public with what they know or what they do. This seems to be especially true of chemists who work in the very important, but relatively unglamorous, food field. Nevertheless, recent events have shown that few subjects can more readily excite interest and concern than questions about the safety of foods.

On March 5, 1960, the new Food Additives Amendment to the U. S. Food, Drugs, and Cosmetics Act becomes fully operative. It places the burden of proving safety of food additives before use upon the food industry. Both intentional and unintentional additives are covered under the law. It is not likely that immediate or widespread changes in food composition or packaging will result. The quality of the U. S. food supply has been good. It will be more closely scrutinized and checked under the new rules.

Food chemists should be acquainted with the new law (under it "food additive" has a new, legal definition) and the regulations promulgated under it. Such knowledge is indispensable to a chemist who may be expected to provide information to industry management or regulatory officials. Beyond those functions lies an opportunity — an opportunity to inform the consumer who is wondering about the food he eats.

Much of the information on food production, food processing, food additives, nutrition, and the relation of these to human health that reaches the public has been embellished to make it more interesting than reassuring. It is true that some practices and additives that were once acceptable under the law no longer are. Public confidence would be helped if people knew that such actions may have been taken without evidence of actual harm to human health, but rather to reduce hazard by providing a greater margin of safety.

Few things that we do or encounter in our environment are without risk. Absolute safety can never be proven. With the food laws, regulatory agencies, food industry, and scientific research that we have today, eating a normal diet has never been safer.

Paul E. Ramstad

THE ADEQUACY OF Food-Additive Toxicity Studies

By A. J. Lehman, Division of Pharmacology,
Bureau of Biological and Physical Sciences, Food & Drug Administration,
U. S. Department of Health, Education, and Welfare,
Washington 25, D. C.

THERE ARE TWO main factors to be considered in evaluating the safety of food additives. The first concerns demonstrating satisfactorily that the proposed additive is in fact harmless and may be incorporated into food to perform some functional role. The second aspect deals with the problem of determining the pharmacology of an additive which may not fall into the harmless class, and with the objective of evaluating the hazards of permissible quantities in food. In either case, a comprehensive pharmacological study is usually necessary to determine the facts. Such studies range in extent from those needing no animal studies, to those which call for several thousand animals. Examples illustrating these extremes will be presented.

Phosphorylated Starches

Food technology has developed a number of forms of modified starches, a promising newer form being a phosphorylated starch. At first glance it would appear that a product developed from two starting materials, starch and a linear phosphate, both having unquestionable recognition as being harmless, would likewise yield an unquestionably safe additive for foods. However, a deeper probing into the problem raises the question of the nature of the phosphorylating reaction. A point to be considered is the location of the phosphate groups on the starch molecules.

Starch, a polysaccharide, is of course metabolized to glucose. It is well established biochemically that glucose, to become available to the body, must be phosphorylated. These natural metabolites are known as glucose-1-phosphate and glucose-6-phosphate. In the starch phosphorylating process it is conceivable that other positions within the glucose residues of the starch molecule are phosphorylated. The phosphate molecule may be attached at least to the 2- and 3- positions as well. Since glucose-3-phosphate, for example, is not a natural metabolite, could it have a different physiological effect than either one of the two natural metabolites?

One way of establishing this would be to prepare these unnatural glucose phosphates and study their effects in animals. There is a simpler approach to the problem, however: that of determining the effects of digestive enzymes on the phosphorylated starch. If it can be demonstrated that salivary, pancreatic, peptic, and intestinal juices split the modified starch into its components, starch and phosphate, and all of the phosphate can be accounted for, then the more complex animal studies are unnecessary.

Nitrated Flour

The use of nitrates and nitrites as curing agents for meats has been an established practice dating back probably 700 years. The function of the curing process is to fix and heat-stabilize the red color in meat. Bacterial action reduces nitrate to nitrite, and the nitrite reacts with hemoglobin to form nitric oxide hemoglobin which is converted to nitric oxide hemochromogen, a red pigment, when the treated meat is heated. Because of unsatisfactory or insufficient formation of nitrite from nitrate, resulting in an insufficient or irregular color fixation, combinations of nitrate and nitrite were investigated and found to be more satisfactory in yielding a uniform product. Meat prepared under federal meat inspection has a limit of 200 p.p.m. of nitrite in the finished product.

Since sodium and potassium nitrate have no effect on blood pigment, these compounds as such do not present a problem of toxicity. In the form of nitrite, however, they present the problem of reducing the oxygen-carrying capacity of the blood by producing methemoglobin. This in itself would not be serious if it were not for the large ratio between the molecular weights of sodium nitrite and hemoglobin, 69:64,000, or about 1:1,000. Thus, one part of sodium nitrite could convert 1,000 parts of hemoglobin to methemoglobin. The best evidence available at present indicates that 1 g. of sodium nitrite does convert 463 to 1,855 g. of hemoglobin to methemoglobin. (The average human has about 700 g. of hemoglobin.) All of the above facts emphasize that the "recipe tolerance" for sodium nitrite is extremely narrow. Although methemoglobin is a normal constituent of blood and the body mechanisms are capable of rapidly reducing methemoglobin to the oxygen-carrying hemoglobin, it is felt that there is sufficient strain on the body mechanisms to handle the present load of nitrate and nitrite ingested in cured meats, without permitting nitrates and nitrites in other items of food such as nitrated flour.

Hydrogen Cyanide As a Fumigant

Hydrogen cyanide, a highly toxic volatile acid, is an effective fumigant for the control of insects in cereal products. The extremely acute poisonous effect of hydrogen cyanide has

tended to overshadow the hazard aspect of small residues which remain when the free acid is employed as a fumigant for food, and of foods which contain a naturally occurring cyanogenetic compound. In the light of the pharmacological and biochemical effects, however, its absolute toxicity becomes of relatively little interest, and hydrogen cyanide is placed in a favorable position, as this applies to the safety of residues in foods.

Although not generally applicable, the statement that toxicity of cyanide compounds is proportional to the extent that hydrogen cyanide is released from the compound has some factual basis. For example, the acutely fatal dose of hydrogen cyanide by the oral route is estimated to be 50 to 90 mg. total for man, or about 1 mg. per kg. The fatal oral dose for potassium or sodium cyanide is given as 200 mg. total, representing 81 and 110 mg. hydrogen cyanide, respectively. These values fall reasonably well within the range given above for hydrogen cyanide.

Hydrogen cyanide is readily converted to thiocyanate in the body. The rapidity of this conversion is demonstrated in a case where one-twentieth the lethal dose of hydrogen cyanide in the form of a soluble cyanide was injected intravenously every 10 minutes. More than the equivalent of an acutely fatal dose was administered without harm to the individual. Sodium cyanide has been employed to determine the circulation time in man in doses of 0.1 to 0.2 mg. per kg. intravenously, the equivalent of 3.8 to 7.6 mg. of hydrogen cyanide total dose; and 20 to 30 mg. total dose orally (the equivalent of 11.0 to 16.5 mg.) have been administered to man to demonstrate thiocyanate in saliva.

Hydrogen cyanide does not react with the bivalent iron of hemoglobin and therefore does not form complexes with this blood pigment. It does, however, prevent exchange of oxygen from blood to tissues by inhibiting the enzymes, principally cytochrome oxidase, responsible for this transport. This effect is reversible.

The chronic ingestion of hydrogen cyanide is without demonstrable effect. Food fumigated with it and containing residues up to 300 p.p.m. has been fed to rats over a 2-year period (1). In an experiment based upon the food intake of young and old rats, the animals in the early part of the trial ingested about 30 mg. per kg. hydrogen cyanide per day, and as the rats grew older, about 15 mg. per kg. per day. Since the acute oral fatal dose of potassium cyanide for rats is between 10 and 15 mg. per kg., yielding 4.0 to 6.0 mg. per kg. hydrogen cyanide, the animals ingested the equivalent of 2.5 to 7 times the fatal dose of hydrogen cyanide each day throughout their lifetime. No effect was noted in these animals.

Hydrogen cyanide, while a rapidly acting acute poison, is of no hazard in the amounts incurred as residues in foods fumigated with it. It is rapidly detoxified. If the rate of intake does not exceed the body-detoxifying mechanisms, hydrogen cyanide can be ingested for prolonged periods without harm, as these mechanisms are practically inexhaustible.

Carcinogenicity

The more uncertain our methods are in determining the effect of an additive, the greater the difficulty in interpreting the results, which in turn leads to a greater demand for an increase in the number of animals in the experimental design. One of the most perplexing problems in this category is the evaluation of the tumorigenic effect of an additive.

Briefly defined, a tumor is a mass of new tissue which exists and grows independently and which has no useful physiological function. There are all kinds of tumors, from those which are entirely harmless to those which rapidly destroy life. In our study of food additives, it is not infrequently that we observe the induction of tumors by the test substance. The significance of such an occurrence requires careful evaluation. Various criteria are applied in our evaluation, and different degrees of apprehension are placed upon the observations when it comes to interpreting them in terms of possible significance for man. Some of the more significant criteria are the number of tumors, time of appearance, the size, and histological appearance.

In the conventional feeding study, animals being fed the test substance are controlled with a group of untreated animals double the number placed on each of the feeding levels. The number, type, and location of spontaneous tumors which develop in the control group are compared with the tumors in treated animals when the experiment is terminated. If there is no difference between the various groups of animals, the fact that tumors have occurred is probably of no significance. However, any difference in number, type, or location could be of significance. The test animals might even have fewer tumors than the controls; this does not necessarily mean that the test substance is a carcinostatic drug; more likely it is the well-known effect of inanition.

Time of appearance: Tumors appearing early in the experiment, that is, in young animals ingesting the test substance, may be serious, and are of greater significance than tumors appearing in the last month or two in a lifetime feeding study. Most spontaneous tumors in rats appear after 1 year of age.

Size: While not as important as certain other factors, size of tumors is a factor in evaluation. A small malignant tumor might be more serious than a large benign one. On the other hand, quite small tumors (a few mm. in diameter) of a given type would be less significant than those several cm. in diameter. There is variance of opinion among pathologists about the size necessary before a mass is called a tumor.

Histological appearance: a) Hyperplasia, or an increased number of still-normal tissue cells, may be simply a healing process in injured tissue. Hyperplasia does not mean tumor formation, though it may be a precursor, but the fact that it is occurring may be important in the final evaluation.

b) Neoplasia is an abnormal and uncontrolled growth of new tissue and is always significant. Invasion of the new growth into surrounding tissues is a grave sign. Great difficulty is often encountered in determining the exact differentiation where hyperplasia becomes neoplasia (the liver is a frequent example) and whether or not invasion has occurred. One condition may grade into the other and the gradation can be so subtle as to be not readily recognized. Pathologists vary considerably in their interpretations in this area.

c) Metastasis. The spread of tumor tissue to other organs or tissues not directly connected with the original location of the tumor practically always means malignancy. This sig-

(Please turn to page 12)

PRODUCTION, PROCESSING, AND UTILIZATION OF

Soybeans and Soybean Products

By Robert L. Terrill, Vice President, Spencer Kellogg and Sons, Inc., Buffalo, New York

THE SOYBEAN IS an ancient agricultural material which has been developed as a major crop in the United States over the past 30 years. It has continually outstripped estimates and shows every evidence of continued growth — but not without some growing pains.

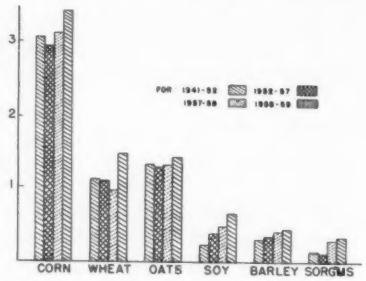
It is probably not an exaggeration to say that soybeans kept the United States from being a hungry nation during World War II, because of the important positions they had attained as a direct source of dietary fats and, indirectly, in animal feedstuffs.

The soybean differs from most other grains in that it is also an oilseed. Only flaxseed among the other major grain crops is also an oilseed; peanuts and cottonseed are not considered grains in the conventional use of the term.

Soybeans contain about 20% oil in addition to protein, carbohydrates, fiber, and minor constituents. For many years soybeans were raised primarily as a source of oil, but can now be said to be raised as a source of protein, with the oil as an important by-product. Recently the value of the protein residue has generally exceeded that of the extracted oil.

Both the oil and protein obtained from soybeans have diverse and economically important uses. The oil is today the principal constituent of margarine, shortening, and salad dressings and mayonnaise; it also has important industrial nonfood uses. Soybean meal — the principal but by no means the only form of protein residue after extraction of the oil — is now by far the most important protein concentrate used in animal feeds.

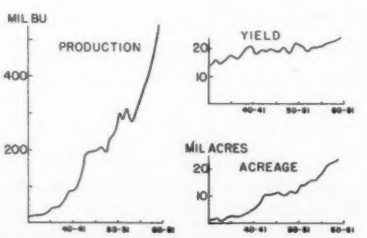
To put soybeans in proper perspective with other grains, note that they are fourth in terms of production, surpassed only by corn, oats, and wheat. Note also that soybeans show a pronounced growth trend.



Grain production, in billions of bushels.

Production

Soybean production in 1958 was about 575 million bushels, roughly 95 million bushels or 20% higher than the 1957 crop which also set a record. The crop has essentially doubled in the past 10 years; 30 years ago it amounted to practically nothing.



Production, yield, and acreage of soybeans.

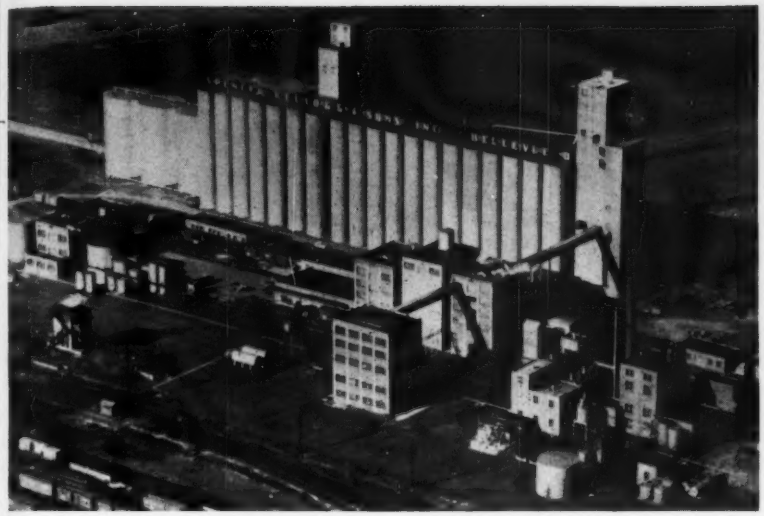
The tremendous increase in production has been a function of a steady increase in acreage and continual improvement in yields. Average yields per acre have about doubled since introduction of the crop in the United States. The crop now extends geographically throughout the Midwest and the eastern half of the U. S., except for New York State and New England. Varietal development has been and continues to be an extensive program. Major varieties grown include: in the Midwest, Adams, Chippewa, Clark, Harosoy, and Hawkeye; in the South, Dorman, Jackson, Lee, and Ogden. Many state experiment stations as well as the U. S. Soybean Laboratory at Urbana, Illinois, have participated in the intensive and extremely effective agronomic program which has widely extended growing areas and increased yields.

Storage and Handling

Storage and handling is comparable to conventional storage for most grains. The concrete silo, "grain elevator" type of storage is probably most common (see photo); it is the most satisfactory but also the most expensive to build. The tremendous production of soybeans in the past few years and the expense of building concrete storage has led to the use of many other types of storage — conventional steel tanks, "flat" storage in various types of buildings, and many experimental designs including tents and plastic-covered temporary piles.

Soybeans are difficult to store only when very weedy or when the moisture content is over about 14%. The relative ease of turning the grain in concrete silo storage is a decided plus-factor when heating of soybeans is encountered; the ability to segregate soybeans of varying moisture and quality is also an important advantage of conventional concrete elevators.

Cleaners and dryers are usually provided in workhouses at one end of a row of silos. The ability to dry soybeans where moisture exceeds certain levels is necessary for good processing characteristics, and essential where dehulling is employed in the manufacture of 50%-protein soybean oil meal. Continuous dryers of various designs and high capacities are characteristic of processing plants. Gener-



Soybean storage plant.

ally about one-quarter to one-half of the total annual crush of a given plant will be received and stored during the harvest period, September 15 to October 15. Large elevators with capacities of several million bushels are, therefore, not uncommon. Soybeans are received at processing plants by both railroad cars and trucks and, since the harvest movement is heavy, the use of automatic mechanical dumping devices is common, enabling the unloading of over 100 cars per day in some cases.

Processing

The processing of soybeans and their many products is a complex industry in itself and can be treated only superficially here. Even the simplest process — the manufacture of crude soybean oil and SOM (soybean oil meal) — is today a highly automated continuous process. Various types of mechanical pressing were once important, but comparatively few soybeans are so processed today except in the South, where they are sometimes crushed at local cottonseed expeller plants.

Practically all soybeans are now processed in modern continuous solvent extraction plants like the one shown, some ranging in capacity up to well over 1,000 tons per day.

The steps involved in obtaining crude soybean oil and SOM include cleaning, drying, cracking, dehulling, conditioning, flaking, solvent extraction, miscella evaporation (to obtain oil from solvent mixture), meal desolventizing and toasting, meal grinding and sizing, and product handling. The accompanying diagram illustrates these steps. Solvent extraction plants are as complicated in design and operation as are many chemical plants and involve very substantial capital investments.

However, the story of soybean processing has only just begun when crude soybean oil and a basic form of protein residue have been obtained. Some of the processes will be mentioned in the discussion of various soybean-derived products. Many plants are equipped to carry out secondary steps; for example, the unit processes in oil treatment include degumming, refining, hydrogenation, deodorization, chemical modification, and resin manufacture. Some plants are equipped to manufacture soyflour, to isolate protein, and even to manufacture adhesives.

Supply and Disposition

As a first step in considering the utilization of soybean products, consider where soybeans themselves go (Table I). One hard economic fact is that the crush is becoming a lower percentage of the production and of total supply of soybeans. Exports have increased and U. S. soybeans are an important factor in world markets; here, however, they must also compete with soybean products manufactured in the United States, and it is obviously favorable to export these products when possible.

The increasing need for high-protein feedstuffs is the factor which will favor an increasing crush. Total consumption of protein meal has increased to nearly three times the prewar average and now stands at over 10 million tons; soybean oil meal comprises about 70% of this total. Continuation of this growth is likely, although probably not at the same rate; thus there will almost inevitably be a large surplus of oil so far as domestic use is concerned. While population growth will require a substantial increase in edible fats and oils — perhaps 2 billion pounds by 1975 — the need for protein will probably outstrip this rate. It is hoped that exports of oil to other countries will make up for any unbalance. The United States is, incidentally, already the world's biggest net exporter of edible fats and oils, supplying nearly one-third of the world total.

Protein Utilization

Since the use of protein is now and will likely continue as the economic driving force for continued expansion of soybeans, let us consider this aspect. By far the most important use of the protein is, of course, as soybean oil meal. This meal, as already mentioned, comprises nearly three-quarters of the protein concentrates used in feeds. Since protein feedstuffs are in good measure responsible for the dramatic advances in animal nu-

Continuous solvent extraction plant.

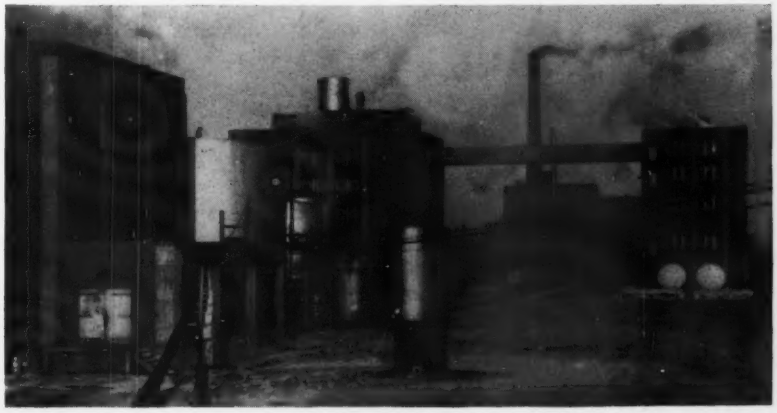


Table I. Supply and Disposition of Soybeans, Crop Years 1952–58 (millions of bushels)

Year	Supply			Disposition			Prices			
	Stocks Oct. 1	Production	Total	Crushed	Exports	Seed, etc.	Support bu	Farmer bu	Meal ton	Oil lb
1952	3.6	298.8	302.4	234.4	31.9	26.0	$2.56	$2.72	$67.55	$0.121
1953	10.1	269.2	279.3	213.2	39.7	25.1	2.56	2.72	78.63	.135
1954	1.3	341.1	342.4	249.0	60.6	22.8	2.22	2.46	60.76	.119
1955	9.9	373.5	383.4	283.1	67.5	29.1	2.04	2.22	52.55	.125
1956	3.7	449.4	453.1	315.9	85.4	42.0	2.15	2.18	47.45	.127
1957	9.9	479.8	489.7	353.8	85.5	29.3	2.09	2.08	52.83	0.109
1958[a]	21.1	575.0	596.1	375.0	90.0	31.0	2.09	...	....	....

[a] Estimated.

Table II. Soybean Oil Meal: Typical Amino Acid Composition

Amino Acid	Percent in 44% SOM	Percent in 50% SOM
Arginine	3.3	3.8
Histidine	1.8	2.1
Lysine	3.5	3.9
Tyrosine	1.1	1.2
Tryptophan	0.6	0.7
Phenylalanine	2.7	3.1
Cystine	0.9	1.0
Methionine	0.6	0.7
Threonine	2.2	2.5
Leucine	4.3	4.7
Isoleucine	3.5	3.9
Valine	3.0	3.3
Glycine	8.5	9.7

trition of recent years, it follows that soybean oil meal itself has played a major role. The essential nutritional function of high-protein feeds is to supply the amino acids not present in the cereal grains consumed by farm animals; that soybean oil meal fulfills this function well is shown by a typical amino acid analysis (Table II).

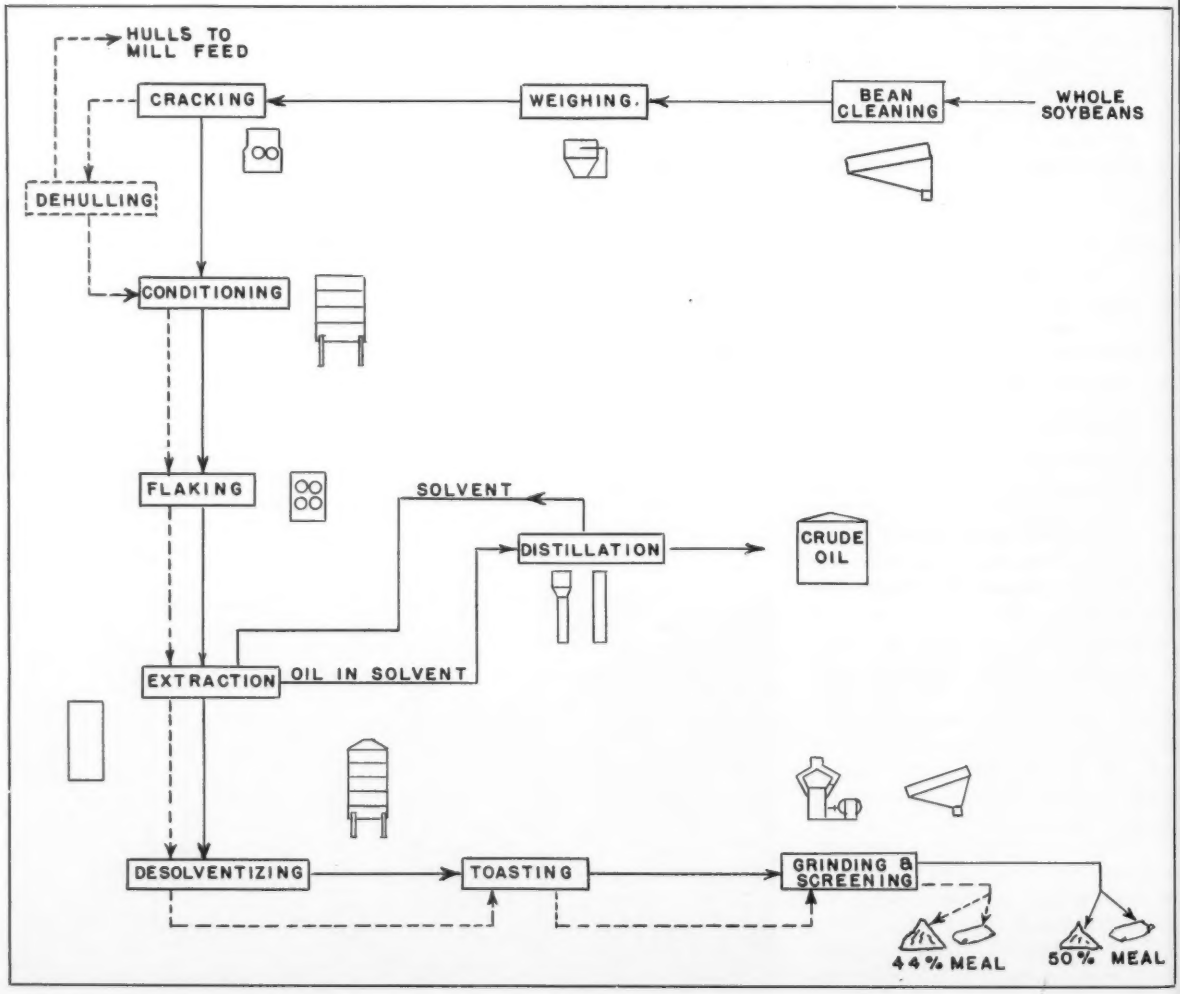
Solvent-extracted soybean oil meal is produced in two basic forms, that with 44% and that with 50% protein. The latter is manufactured by solvent extraction of the oil from dehulled soybeans; removal of the hulls, which comprise as much as 8% of the bean, results in a meal of higher protein and lower fiber content. Low fiber is of special significance in the broiler industry.

The proper cooking or toasting of SOM to impart optimum nutritional characteristics has been the subject of extensive investigation; the meal must be neither undercooked nor overcooked.

Definitions and standard specifications of the National Soybean Processors Association for soybean oil meal are as follows:

"Soybean oil meal is the ground soybean oil cake or ground soybean oil chips. A name descriptive of the process of manufacture, such as *ex-*

Diagram of modern soybean processing.



peller, hydraulic, or *solvent-extracted* shall be used in the brand name. It shall be designated and sold according to its protein content."

Standard Specifications for Soybean Oil Meal

	%	%	%
Protein (min.)	41.0	44.0	50.0
Fats (min.)	3.5	0.5	0.5
Fiber (max.)	7.0	7.0	3.0
NFE (min.)	27.0	27.0	27.0
Moisture (max.)	12.0	12.0	12.0

Soyflour

The soybean has been used for human food in Asia for centuries. Among such uses are 1) fermented forms for sauce and seasoning, 2) sprouted forms for vitamin-bearing green vegetable foods, 3) soybean milk, 4) roasted, 5) ground for high-protein flour. Substantial quantities of soyflour are used in foods for human consumption today in the United States; in 1956, about 114,000 tons were produced. Three principal types for human consumption are available:

1) *Full-fat soyflour* — contains all the oil of the natural soybean, with hulls removed.
2) *Low-fat soyflour* — contains 4.5–9.0% of oil; made from dehulled soybeans.
3) *Defatted soyflour* — contains less than 1.0% of oil; made from dehulled soybeans.

Protein content ranges from 42 to 52%, depending on the type, and all are low in fiber (maximum 3.5%). The flour is high in net protein value, measured in terms of protein content, digestibility, and biological value. It is used in a great variety of foods — pet foods, doughnut and waffle mixes, sausages, bread, etc. Even at the relatively limited level of use, soyflour makes a significant contribution to protein in the diet.

Soybean flour and isolated protein also has important industrial uses, principally as adhesives, paper coatings, etc.

Soybean Oil

Soybean oil is chemically the mixed triglyceride ester of linoleic, linolenic, oleic, and saturated fatty acids. The fatty acid composition is approximately as follows, but of course differs with variety, growing area, and conditions:

	%
Linoleic acid	55
Oleic acid	28
Saturated acids	12
Linolenic acid	5

Soybean oil is traded in two forms, crude and degummed crude. Large quantities of refined soybean oil are manufactured and shipped to shortening and margarine producers, and many processing plants manufacture a completely refined and deodorized salad oil for use by food packers and mayonnaise manufacturers.

A typical specification and analysis for edible-grade soybean salad oil would be:

Specifications

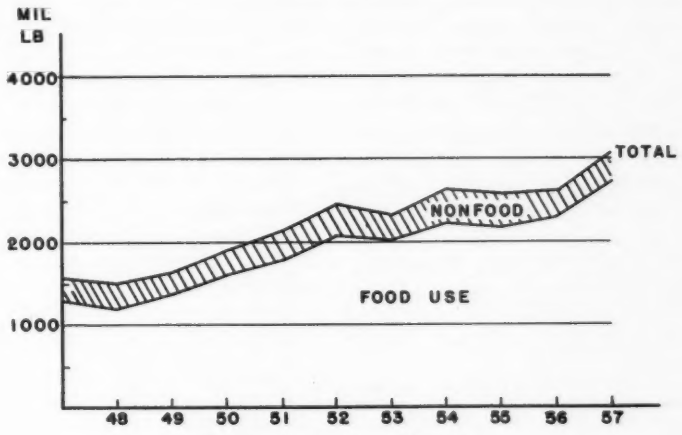
F.F.A.	0.05 max.
Color	20 Y, 2.0 R max.
Peroxide Number	1.0 max.
Consists of 100% pure soybean oil	

Average Analysis

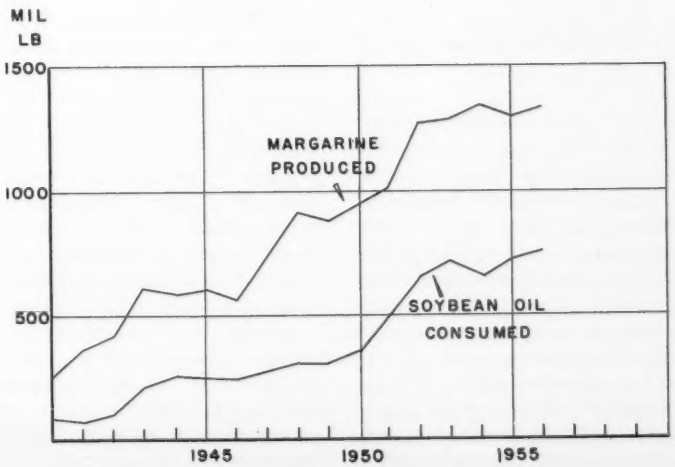
Iodine Number	127–137
Saponification Number	188–196
Specific Gravity	0.924–0.926
Kreis Test	negative
Moisture and Volatile Matter	0.1% max.
Insoluble Impurities	0.01% max.
Unsaponifiable Matter	0.75% max.
Titer	21–24°C.
Cold Test (AOCS cc 11–42)	negative
Smoke Point	450° min.
Refractive Index 45°C.	1.465–1.466

Soybean oil is mostly an edible oil, with food uses generally making up 85% or more of the total; further, the nonfood uses have been fairly stable in amount for the past few years and show no evidence of substantial growth. On the other hand, food use should increase substantially in the next 15 years, as has already been noted. The use of soybean oil for food and nonfood purposes, 1947–57, is shown in a graph.

The oil is used in direct fat consumption, principally in the form of margarine, shortening, or salad dressings. Per-capita consumption of margarine in 1958 averaged about 9.1 lb. as compared to 8.5 lb. for butter. The growth of margarine use can be visualized by considering the fact that in 1935–39 it was only about one-sixth that of butter. The production of margarine and the amount of soybean oil consumed therein has grown steadily over the past 15 years (see below).

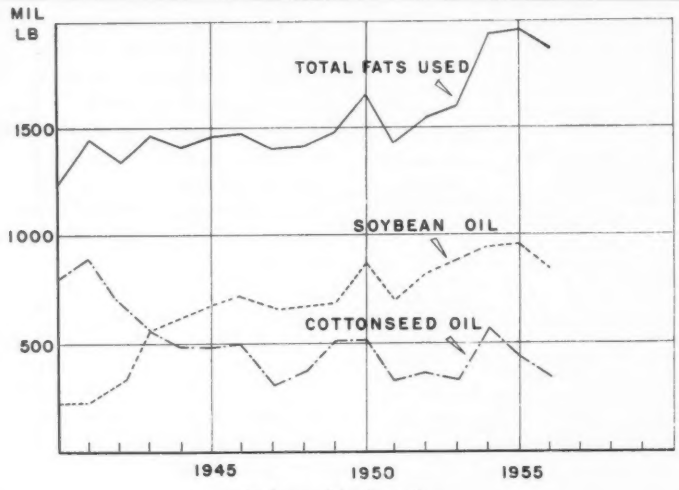


Soybean oil utilization, 1947-1957.



Use of soybean oil in margarine.

Soybean oil has occupied an increasingly important position in shortening, mostly at the expense of cottonseed oil (see graph). The fact that substantial amounts of animal fat are now used in shortening can also be inferred from the graph.



Soybean oil in shortening.

For use in both margarine and shortening, soybean oil must be refined, bleached, hydrogenated, and deodorized, either alone or combined with other oils and fats. The hydrogenation step lowers the iodine value to about 60–75 and, of course, converts the liquid oil to a hard fat; however, residual unsaturation still exists, as evidenced by the iodine value.

Owing principally to its linolenic acid content, liquid soybean oil is to a degree subject to flavor reversion and rancidity; however, modern refining and stabilizing procedures result in a product which is widely used in the liquid form.

Although the industrial nonfood uses of soybean oil make up only a small portion of the total consumption, they must not be considered unimportant. Also, it is possible that current research will increase industrial use many times over the present quantity. Soybean oil-modified alkyd resins are now of great importance in the coatings industry, and a research breakthrough could easily double the current industrial use of 300-plus million pounds.

Many other soybean products have important and sizable uses. For example, some 25 to 35 million pounds of soybean lecithin is produced annually and finds its way into foods, cosmetics, and even paint.

The future expansion of the soybean crop depends on many factors, both technical and economic. Expansion of protein uses seems likely to occur at a faster rate than for the oil, which is already in surplus. In part, the future depends on relatively nonpredictable economic factors such as government price-support policies. However, the question is not whether there will be further growth, but how much there will be. It is certain that soybeans will be around a long time as a major agricultural crop and that the story of soybean utilization is far from finished.

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Lehman:

(Continued from page 7)

nifies going from bad to worse. In contrast to this are the benign tumors which do not possess the properties of spreading to other parts of the body, and may be entirely harmless.

An important unanswered question regarding tumors induced by a chemical is whether or not the tumor will regress if the causative agent is withdrawn from the animal exposed to it. It is possible that at certain stages in the induced tumor development, the process is reversible if the stimulus is removed.

Strong tumorigenic substances are not difficult to recognize even with small groups of animals. Those substances which have a weak effect present unusual difficulties. The number of animals required to develop data adequate to enable the pathologist to decide the weak or borderline cases is about 2,400 animals, involving two strains of mice, two strains of rats to which the test substance is administered to appropriate groups of animals by injection and oral routes for their lifetime, and a 7-year feeding study in dogs. It is hoped that as we gain experience in this field we may be able to reduce the number of animals. Because of the chronic nature of induced tumor formation, there is little hope that the time involved can be reduced.

Conclusion

Depending upon the available knowledge, an additive may require no further work to establish its safety. In other instances a consideration of the chemistry involved may be sufficient. In still another instance a carefully designed experiment with a limited number of animals may furnish the desired information. And finally, where the mechanism of possible injury is poorly understood, several thousand animals may be required.

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WHEAT RESEARCH AT BELTSVILLE

The Hard Red Spring and Durum Wheat Quality Laboratory

By C. C. Fifield, Chemist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland

QUALITY OF THE grain is one of the most difficult to measure of the many characteristics that must be considered in a wheat-breeding program. Because of the many quality requirements, it is difficult to develop new varieties that meet the needs of the wheat industry. This situation is further complicated by different meanings of quality at different times, and by the changing demands in the flour specifications of the miller, who must supply the baker with a satisfactory bread flour. By the same token, the manufacturer of macaroni products is also interested in durum varieties having characteristics required for the best over-all performance.

Quality in wheat or flour has been and still is, to a certain degree, a term having various meanings. The meaning may depend upon the end-product to be produced and also upon changing market demands for certain foods. Vastly more is known today than 50 years ago about the quality demanded for products from the cereal grains. This information has been of assistance in evaluating the quality of new selections of wheat for possible increase and release for commercial production.

The Hard Red Spring and Durum Wheat Quality Laboratory, located at Beltsville, Maryland, is one of four regional quality units administered by the Crops Research Division of the Agricultural Research Service, U.S. Department of Agriculture. Quality improvement has been studied in cooperation with nine states in the spring wheat area; the Grain Division, Agricultural Marketing Service, U.S. Department of Agriculture; Canadian Grain Research Laboratory, Winnipeg, Canada; and the Northwest Crop Improvement Association, which represents the milling industry and the grain trade. In recent years cooperative studies have also been carried out with the Pennsylvania and Wisconsin agricultural experiment stations with tetraploid and ordinary strains of rye.

The principal function of the laboratory is to evaluate the quality of new hard red spring and durum wheat selections developed by plant breeders in the north-central states. The laboratory also has a number of other functions relating to the improvement of wheat: 1) the development of new testing methods with emphasis on micro procedures, 2) improvement of existing quality tests for hard red spring and durum wheat, and 3) research on the factors responsible for basic differences among the varieties and between the two types of spring wheat grown in the north-central states.

Characterization and quality-evaluation studies, carried on early in the development of new varieties and throughout the years of testing, help plant breeders to retain for increase only selections that will meet the exacting needs of the wheat industry. Special reports to breeders, mimeographed summary reports, articles published in technical and trade journals, and presentations and discussions before workers' conferences at scientific and trade meetings by the personnel of the laboratory—all these provide means of making the quality information available.

Techniques for Measuring Quality

Striking improvements in methods of measuring or comparing qualities have been made since Saunders (10) used the chewing test to determine the quality of Marquis, a hard red spring wheat variety of satisfactory bread-baking quality. At least four distinct categories should be recognized: milling quality; quality for bread; quality for cake, cookies, and similar products collectively called pastries; and, in the case of durum wheat, quality for macaroni products. The Beltsville laboratory is interested principally in evaluating the quality of wheats used for bread and macaroni products. Research is directed toward a better understanding of what constitutes quality in the various strains and varieties, and how it can best be measured. The information derived from the special studies is of interest from both a practical and a scientific viewpoint.

Sources of Samples

Samples from two main sources are received in the laboratory for quality-evaluation studies. One consists of grain from each variety or new selection grown in plant breeders' advanced uniform nursery trials. At the Beltsville laboratory composites are made from the small individual samples of each strain received from a number of field stations in the spring wheat area. These composites represent the Uniform Eastern and Western Hard Red Spring Regional Nursery Samples and usually include the most promising new selections. In addition, a number of strains resistant to wheat-stem sawfly, including standard varieties for comparison grown in the International Sawfly Yield Nurseries at several locations in North Dakota and Montana, are composited and tested. Grain from single-

station nurseries is also received for analysis. Nursery-grown durum strains (approximately 150 g.) representing fourth- or fifth-generation lines screened for agronomic characteristics, are received for preliminary macaroni testing. The quality tests applied in evaluating the varieties or strains depend on the size of the sample available and the nature of the wheat. From these trials 100 to 150 g. may be available from single-nursery tests and 2,000 g. or more from the composites to represent each variety.

A second source of samples is drawn from tests of the hard red spring and durum varieties being considered for release and new ones just coming into production. Grain from these varieties is available in relatively large quantities from field-plot trials at numerous individual stations. Such varieties have generally shown satisfactory quality in preliminary tests but need more intensive study before final approval. Four- to six-pound lots of these varieties, together with suitable standard varieties of the approved hard red spring and durum wheats, are received for testing.

Approximately 900 samples of hard red spring and durum varieties and strains are characterized and evaluated each year. Milling, bread-baking, and other quality tests are made on the former; and long-type macaroni, spaghetti, or macaroni-disk, color, and other tests on the latter. Samples of Tetra Petkus rye and five varieties or ordinary rye have been received from one to five stations each year. Samples of Marquis and other varieties of hard red spring and winter wheats that have been held in storage are sampled at 5-year intervals. These samples are now 25 to 33 years old. A few special wheats for specific tests comprise some of the additional lots received for study.

The various types of studies conducted in the laboratory are outlined under several headings.

Bread-Baking

An experimental bread-baking test, using the rich bromated formula (2), is made on varieties and strains of hard red spring wheat from plot trials and uniform regional nurseries and on certain other special samples, as a measure of their quality for breadmaking. Quality characteristics of the newer wheat strains are determined by comparing the quality data with those of the standard approved hard red spring wheat varieties grown under comparable conditions. Higher loaf volumes are generally associated with superior bread-baking strength. Loaf-volume data are reported on the basis of the flour protein actually represented in the samples, as well as on the basis of the loaf volume expected in view of the protein content. Also considered in evaluating the newer strains for making bread is the expected loaf volume, based on the relation of protein content to loaf volume obtained from baking experiments on flours from 589 samples of ten hard red spring wheat varieties, from the crop years 1944 to 1947 (6). Appreciably lower loaf volume than expected indicates a variety having questionable or poor quality, whereas a much higher than expected volume indicates superior strength for bread. This means of interpreting loaf-volume data has been helpful in evaluating gluten quality, especially where differences in protein content are large. The crumb grain and color are also judged and reported as numerical scores.

Records of the past half century indicate that in a number of important respects the new varieties are as good as, and in most instances better than, the older varieties. In the period starting about 30 years ago, a number of hard red spring varieties that had certain advantages over the older varieties in milling or baking quality were distributed. Marquis, introduced in the United States in 1912 and 1913, was for many years the most important variety in the Northwest. Marquis has been compared with the newer varieties and they in turn with each other for milling and baking behavior.

Mida is similar to Marquis in quality characteristics but not such a strong wheat as Thatcher. Rescue, resistant to stem sawfly, is not so high in protein content as Thatcher, but the quality of the gluten is good and the loaf volume is satisfactory in relation to its protein content. It is considered only medium in baking strength. Lee averages about 0.5% higher than Thatcher, but is not so strong as some of the other acceptable varieties. It is outstanding in crumb color of bread. For equal or nearly equal test weights, Thatcher usually produces more flour than Marquis or Ceres. Both Rival and Mida appear to be definitely superior to most other varieties with respect to flour yield as well as test weight. Rushmore has softer-textured grain than many of the other hard red spring varieties, but has good milling characteristics, and the bread from it has exceptionally good grain and texture. Selkirk, a variety resistant to race 15B rust, should be mentioned since it is grown in relatively large volume and has produced wheat that, while weaker than Thatcher, can be classed as medium in strength and quality. Centana, approved 2 years ago at the Northwest Crop Improvement Association's yearly meeting for growing in Montana, is a strong wheat of satisfactory bread-baking quality. Baking tests represent a continuing project toward the production of strong-quality hard red spring wheats.

Pearling-Index Test

A simple measure of kernel hardness in wheat is the pearling test (11). Made with a barley pearler and requiring only 20 g. of grain, it has proved of practical value in determining hardness or softness early in breeding programs. The test is useful in indicating the type of flour that will be produced from a new selection of wheat. Varieties such as Henry and Russell are softer than the average spring wheat and consequently they produce flours that are more velvety than those of Thatcher or Conley. The latter wheats, harder and more vitreous, make flours that are more granular and harsh to the touch. The pearling test is so specific that no variety with hard texture has been found that is satisfactory for making cake or cookie flour, regardless of its protein content.

The pearling test has also been found useful as a practical guide in conditioning samples of wheat for milling. Pearling-index values indicate the hardness of the grain. The harder the grain, the more moisture is required for the milling process. The method has been of considerable value in arriving at optimum tempering conditions for wheats varying in hardness. Used in connection with tempering wheats, it tends to standardize one phase of the milling technique.

Durum Research

Our studies with durum wheats have been made to evaluate and characterize the potential quality of the new strains in comparison with

the accepted varieties and to understand better the characteristics that determine macaroni quality. Macaroni and spaghetti tests have been made from varieties and strains in our breeding programs since the establishment of the experimental macaroni equipment (1) in the Department in the early 1930's.

Improved techniques have made it possible to develop durum varieties of better quality. One of the most significant contributions was the development of the disk test (5) (see photo), which requires only a small amount of time and about 125 g. of grain. It has materially increased the effectiveness of the durum evaluation program. In this method, the wheat is milled to produce semolina in the usual way. Semolina dough is then pressed into disks ¼-in. thick and about the diameter of a silver dollar. Translucency and color, important quality components, can be determined from the disks as easily as from the macaroni or spaghetti. In terms of labor and time, the disk test is eight to ten times as efficient as the larger-scale macaroni test.

Another quality test, performed on semolina produced from varieties of durum, involves mixogram curves made on the National Swanson-Working Mixograph equipment.[1] This machine records changes in the doughs during mixing. The curves for Yuma indicate a characteristically strong or the greatest degree of gluten strength, whereas Sentry produces mixogram patterns indicating weak properties. Other varieties such as Towner, Ramsey, Vernum, Mindum, and Langdon make curves indicating gluten of intermediate strength.

The gluten-washing test supplies valuable information respecting the quality of durum strains and varieties. Some varieties, like Yuma, have strong, elastic, and firm gluten, in contrast to that of Brawley 156, which is short and firm, and of Sentry which is soft, slimy, very sticky, and nonelastic. The test requires only a small amount of sample and hence is useful for testing quality in early generations.

During recent years a number of new durum wheats have been released. Most of these are equal in quality to the old varieties, or are better. Sentry is perhaps the best of these in color for macaroni products, but has weak gluten.

[1]Mention of specific equipment does not constitute endorsement by the U.S. Government.

Micro equipment for making macaroni disks to determine quality of small samples of durum wheat. Mixer and kneader are shown at extreme left and the press on the extreme right.

With the increase in automatic macaroni processing, physical dough properties of durum varieties are becoming more important. Mixogram and gluten-washing tests are two of the means used for measuring them. Weak, sticky doughs are not desirable, especially in the production of long-type goods. For long macaroni and spaghetti, a tough, nonelastic gluten is desired so that the product will not stretch when it is placed on the sticks in the drying process.

Oxidation Studies

It has been our observation that since 1950 there has been an increase in oxidation requirements of hard red spring varieties. During the time when Thatcher and Mida were leading spring varieties, the flours milled from them had comparatively little need for oxidation. With Selkirk, released a few years ago, the reverse is true, and maturing agents must be added for best results. It appears that oxidation requirement is influenced more by variety than by environment. The study on oxidation response is being continued to determine whether a variety can be produced that will require no artificial treatment for making good bread.

Flour-Yield Research

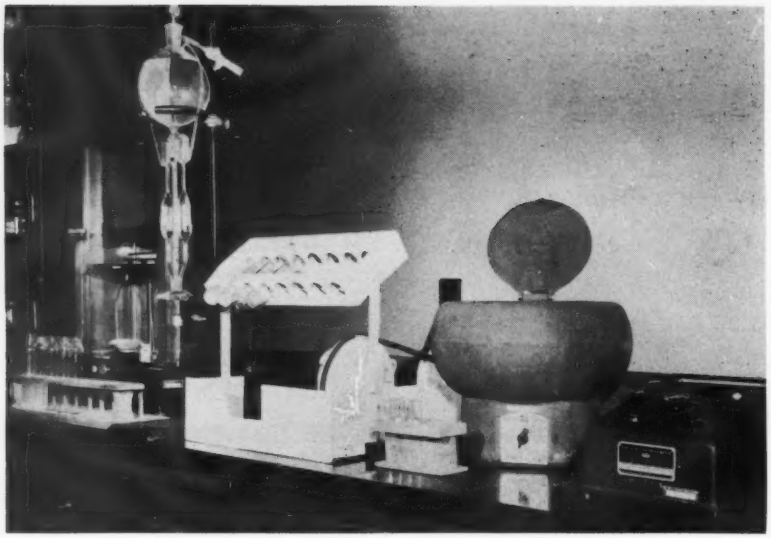
Another problem of interest is the yield of white flour obtained from wheats grown under different environments. A number of wheat varieties grown in Mexico and the United States have been evaluated for flour-yield capacities in relation to their weights-per-bushel. The Mexican-grown wheats of comparable class and weight-per-bushel generally produced significantly higher flour yields than those grown in the United States. It was concluded that the plumpness of the Mexican-grown wheats accounts in large part for their high flour-yielding capacity. This may possibly result from the cool preripening weather in Mexico which provides a longer fruiting period.

Development of a Protein Test

Attention has been devoted to devising simple tests for measuring specific quality characteristics. A protein test based on the biuret reaction (8) (see photo), developed a few years ago for wheat and flour, is simple, rapid, and inexpensive. The protein is peptized by treatment with an alkaline solution of copper sulfate, stabilized by a small amount of glycerol. The color intensity of the reddish-violet product, which is proportional to the protein concentration, is determined with a colorimeter. Approximately 5% of the protein remains unpeptized and, therefore, not directly measured. Nevertheless, biuret color values are closely correlated with crude-protein values as determined by the Kjeldahl method. It is well known that bread loaf volumes are generally closely correlated with Kjeldahl protein content. In this study, they are shown to be correlated about equally well with biuret color values.

Sedimentation Test

The sedimentation test for wheat quality originally developed by Zeleny (12) has been further refined (9) and the possibilities of its use in



Equipment for the biuret method of determining wheat and flour protein.

wheat breeding explored.[2] The test is based on the swelling and settling of gluten when flour is suspended in water and treated with lactic acid. It is a combined measure of gluten quantity and quality and is therefore an index of bread-baking strength. High positive correlations are usually found between sedimentation value and bread loaf volume, and between sedimentation value and mixing time and tolerance.

Recent studies (see footnote 3) on 159 samples of hard red spring wheat representing F_3 generation lines from a cross between a high-protein, strong-gluten variety and a low-protein, weak-gluten strain have shown that the sedimentation test could be used effectively to select the lines having long-mixing tolerance and presumably superior bread-baking quality. Because of its simplicity, the test can be applied quickly to large numbers of small samples. With a semi-micro technique, it should be possible to apply the test to wheat from individual plants and still have enough kernels left for seeding.

Tetra Petkus, a Tetraploid Strain of Rye

There has been considerable interest in Tetra Petkus rye, a tetraploid variety, developed in Germany by treating diploid Petkus with colchicine to double the chromosomes in the plant. It was first grown on an experimental scale in the United States about 8 years ago. Studies were undertaken (3) on grain grown in Wisconsin and Pennsylvania, to obtain a better understanding of the quality of the variety.

The milling and baking qualities of Tetra Petkus have been compared with qualities of five ordinary diploid varieties—Imperial, Caribou, Adams, Balbo, and Von Rumker—grown under similar conditions. The test weight per bushel of Tetra Petkus was lower than that of ordinary rye, but this variety produced about the same percentage of flour on the experimental mill. Tetra Petkus milled satisfactorily and was similar to the ryes included as standards of comparison. The flour was similar to standard flours in color, feel granulation, and ash content, and was slightly higher in protein and had greater activity of alph-amylase and diastase enzymes. Tetra Petkus flour appears to be slightly better in mixing tolerance and somewhat stronger in general physical dough properties. However, the dough was very sticky, difficult to handle, and generally inferior to doughs of diploid rye flours.

The seed of Tetra Petkus is about double that of ordinary rye. This poses a problem in cleaning before milling. Standard equipment cleans ordinary rye but discards the much larger Tetra Petkus rye grain as well as other very large seeds and grains.

According to a 20-member tasting panel, the rye flavor in bread made from the Tetra Petkus is stronger than in the breads made from three of the ordinary, comparably grown ryes.

Amino Acid Studies

Little attention has been given to the distribution of amino acids in flours and in feed fractions from wheat, or to the retention or loss of amino acids in yeast-leavened or unleavened doughs and breads. In one of our cooperative studies (7), eleven amino acids of whole wheat were quantitatively accounted for when the flour, bran, and shorts were assayed by microbiological procedures. There was no destruction of amino acids during fermentation of the doughs prior to baking into bread. The standard deviations of the amino acid values for all products were calculated, and an analysis of variance was applied to ascertain significant differences between the mean amino acid values for doughs and breads. Losses of cystine, lysine, and methionine during baking were significant. Most of these amino acid losses may have taken place in the crusts. Since the proportion of crust to crumb in the small experimental loaves is greater than in commercial loaves, it is probable that in the analysis of commercial loaves, some of the losses of amino acids may not be significant.

Storage Studies

A number of studies have been made to determine what factors affect the successful long-time storage of wheat on the farm and in commercial grain elevators. There has been much discussion as to the length of time wheat can be stored and still remain viable or usable for milling and baking purposes. Marquis and Kanred wheats stored 25 to 33 years were investigated recently (4). The quality of the bread, as judged by loaf volume, was in all but four cases substantially the same as for the samples taken in 1938. There has been a gradual and important decrease in bread grain and texture for eight of the eleven lots of stored wheat since they were first tested in 1938.

Storage had no consistent effect on protein content except that one-third of the samples showed a slight apparent loss, possibly due to sampling error. Thiamine values, too, were the same for the stored wheats.

Viability decreased progressively with age, but the rate of decrease was not the same for all samples. Kanred

[2] Zeleny, L., Greenaway, W. T., Gurney, Georgia M., Fifield, C. C., and Lebsock, K. Sedimentation value as an index of dough mixing characteristics in early-generation wheat selections. Cereal Sci. Today (accepted for publication).

variety lost viability somewhat faster than Marquis. Practically all the wheat was nonviable after 30 years, but, nevertheless, continued to make good bread.

There was a definite and fairly regular increase in fat acidity during storage, indicating a certain amount of progressive deterioration. This, however, did not affect the baking tests as much as might be expected.

Beginning with the 1921 crop, samples of wheat from several years were stored at Fort Collins, Colorado, in bags in a dry, unheated room. Tests have been made on these samples periodically since 1938. Perhaps an important reason for this wheat's storing so well was the fact that it was sound and dry when put into storage, and under the atmospheric conditions at Fort Collins the wheat maintained an average moisture content of 11%. Insect damage was kept to a minimum by periodic cleaning and fumigation.

Collaborative Studies

The Northwest Crop Improvement Association holds meetings each year to discuss the results of collaborative milling and baking tests for a number of promising new hard red spring wheats and the milling and macaroni-making quality of a number of promising durum wheats. Each year representatives of commercial mills and state and federal technologists test numerous samples to determine their qualities and make recommendations respecting their increase and release to farmers. In certain years collaborative milling and baking studies are also carried on with the Canadian Grain Research Laboratory, Winnipeg, on some of their most promising varieties of hard red spring wheat. Our active part in these programs is helpful in evaluating the quality of the more promising varieties of wheat and in keeping abreast of the requirements of the industry.

Future Aims

There are still many problems needing attention by those who are testing new wheats developed by plant breeders. In brief, we are concerned with determining whether a wheat strain or a new variety has the right properties to fit the needs of the miller and baker and also to serve the farmer to the best advantage. The function of a wheat quality laboratory should be to measure wheat properties and then have the technologist express basic quality differences precisely, in such a manner that they can be interpreted to meet present needs.

A critical need in the hard red spring region at present is for spring wheat varieties that have long mixing time and greater mixing tolerance. Generally speaking, varieties with shorter mixing times are weaker and have less tolerance in the bakery. Bakers using the continuous dough process prefer uniform and strong-type flours for the best over-all performance. The continuous process of making bread, or a similar type of process, is rapidly being adopted. It is an important consideration in developing wheat varieties. Research in the laboratory is to be intensified to provide information to answer this need.

Additional effort is to be made to examine and test more nursery-grown samples comprising F_4 and F_5 lines. The screening of such early-generation material should be a step in the right direction to meet the needs for the early increase and release of hard red spring wheats of stronger quality. Basic research will also have a part in the development of new wheats and for better understanding of quality components in a search for improved hard red spring and durum wheat varieties.

Acknowledgment

The assistance of the laboratory staff in the preparation of this report is acknowledged.

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FARINOGRAPH TECHNOLOGY WORKSHOP

MAY 5-6, CHICAGO

To be conducted by the AACC's Physical Testing Methods Committee. An eight-hour school on the theory and use of the farinograph to be held immediately after the AACC's Annual Meeting which ends the afternoon of May 5. Advance registration closes February 15. Write now for details to: American Association of Cereal Chemists, 1955 University Ave., St. Paul 4, Minnesota OR see page 309, December 1959 issue, CEREAL SCIENCE TODAY.

People, Products, Patter

• • • People

Jack Davis appointed technical director, J. D. Jewell, Inc., in charge of quality control for the company's operations in Gainesville, Georgia, and for Southern Frigid Dough, division of the Jewell company in Florence, Alabama. **R. H. Ellinger** is with the company's frozen foods department in Gainesville. **William V. Hodge** appointed technical director, dough products development, of Southern Frigid Dough. **Tom McGough** is also with this division of the Jewell operations.

R. E. Eckton, technical service manager of Givaudan & Co., Ltd.,

Whyteleafe, Surrey, England, recently spent three weeks visiting in the United States; he toured the Givaudan facilities in New York City, and studied market conditions in America.

Owen F. Harris transferred to Des Moines, Iowa, plant of General Foods Co. as Products Control Manager.

Warren H. Holmes now with International Milling Co., Minneapolis, Minn.; from American Bakeries, Chicago.

H. W. McCune named associate director of Procter & Gamble's research division, in charge of inorganic research department at P&G's Miami Valley Laboratories.

Herman Mohl, technical director, Overseas Division, The Pillsbury Co., married **Miss Helen Burgstahler** on Saturday, Dec. 5. After a three-week honeymoon in the Caribbean via luxury tramp steamer, the Mohls will be at home in Minneapolis.

M. K. Narayanan of the Central Food Technological Research Institute, Mysore, India, has arrived at the Grain Research Laboratory, Winnipeg, on a post-doctorate fellowship which was awarded to him by the National Research Council of Canada. He is a graduate of the University of Madras and obtained his Ph.D. at the University of Bombay. His main work has been in vitamins and antioxidants, and he will continue studies on the latter subject under direction of **I. Hlynka** of the Grain Research Laboratory.

Arch Payne died suddenly on October 29, at age 60, while on a business trip in Richmond, Virginia. Surviving are two daughters, Phyllis and Nancy.

Mr. Payne was recently elected assistant vice-president of Florasynth Laboratories, Inc., New York; he had been East Coast sales manager for the past ten years. Before joining the company 14 years ago, he was with Shell Oil Co.

Earl C. Peterson named plant manager at Buffalo, N. Y., for The Pillsbury Co.; formerly in charge of production and engineering at Pillsbury's Springfield, Ill., plant. He replaces **Harry Eikenberry.**

Quentin R. Russeth named technical manager, mixes, for The Pillsbury Co.'s bakery mix and institutional products division; will be concerned with new product development and product formulation, responsible for the test bakery and kitchen.

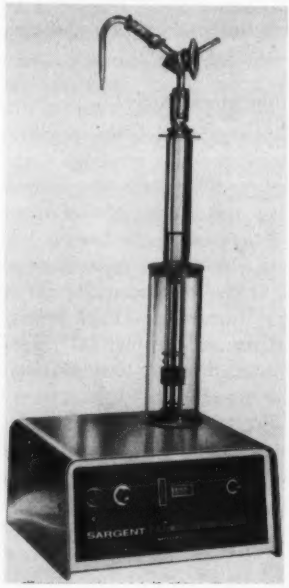
Raymond E. Toepke named sales representative for corn products by the Post division of General Foods Corp.; will represent the division's Corn Mill operation at White Plains, N. Y., and will specialize in sales of corn meal, flour, confectionery flakes, and pregelatinized corn starch to the bakery, biscuit and cracker, and food processing industries.

• • • Products

Laboratory services. A new illustrated brochure describing both special and routine laboratory services has been issued by Harris Laboratories, Inc., 816 "P" St., Lincoln 8, Nebraska. In addition to standard services in research and testing for the food, pharmaceutical, and agricultural industries, several unusual facilities are listed. Among these are technical surveys for investors and lending agencies, research farm facilities, and insurance liability investigations. The brochure is available without cost; address a request to the firm on your company letterhead.

• • •

Constant-rate buret. A precise constant-delivery device for titration with laboratory recorders, newly developed by E. H. Sargent & Co., (see photo), has ground Pyrex glass solution barrels and plungers, operating on a simple displacement principle with the plunger driven at a constant rate



by a synchronous motor. Neoprene "O" rings and Quad rings held in stainless-steel collars with spring loading are used for sealing. Motor drive is transmitted to the plunger by a precision-ground stainless-steel lead screw running in a nylon following member. Drive is self-limiting at both ends of the lead screw and automatically resumes on reversal. A separate motor provides rapid motion of the plunger in both directions for refilling from a directly connected reservoir and for discharging excess titrant and flushing.

For further information address: E. H. Sargent & Co., Dept. CR, 4647 W. Foster Ave., Chicago 30, Ill.

• • • **Patter**

Brewing Chemists' Convention. Anyone in the brewing industry may submit technical papers for the 1960 convention of the American Society of Brewing Chemists, according to an invitation extended by Mortimer W. Brenner, president. The society in this way hopes to broaden the participation by members of the industry in its annual convention, to be held in Minneapolis, Minn., May 8–12, 1960.

Mr. Brenner stated that excellent technical presentations have been made in the past concerning laboratory problems, brewing industry basic research, and brewing and malting technology. He expressed the hope that "more of our associates in the industry will offer papers on a broader range of subjects than heretofore and thus contribute to the society's important function of collecting and disseminating technical information."

Those interested are asked to communicate with Michael R. Sfat, Rahr Malting Co. Research Lab., Manitowoc, Wis. The following deadlines have been set by the program committee: title and author by January 1, abstracts by February 15, and manuscripts by April 1, 1960.

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Members of Symposium on Wheat Variety Development, AACC Tri-Section meeting, October 10; L to R: E. G. Heyne, Kansas State Univ.; C. O. Johnston, USDA; D. B. Pratt, Jr., The Pillsbury Co., AACC president; J. A. Shellenberger, Dept. Flour & Feed Milling Industries, KSU; R. H. Painter, KSU; and John A. Johnson, KSU, AACC president-elect.

Banquet speakers, annual Tri-Section meeting, AACC, L to R: Phillip Talbott, exec. sec.; G. D. Miller, Dept. Flour & Feed Milling Industries, Kansas State Univ., presiding; and E. E. Jarnagin, vp, Grain Defense Planning Committee, Grain Division, USDA.

ACS award sponsored by Sargent. E. H. Sargent & Co. announces its sponsorship of the American Chemical Society Award in Instrumentation, which recognizes and encourages achievement in the origination, improvement, or application of instrumental methods of chemical analysis. The award consists of $1,000 with an appropriate certificate, and an allowance for traveling expenses (up to $150) to the meeting at which the award is presented.

A candidate must have accomplished a practical and significant improvement over prior chemical analytical techniques, by origination or modification of laboratory methods employing instrumental actuation or measurement. He must be a resident of the United States or Canada.

The 1960 winner will be announced in the fall of that year and the presentation will take place at the spring ACS meeting in 1961.

• • •

Science fellowship established. E. H. Sargent & Co., manufacturer of scientific instruments, announces that its distributing representative in Australia, H. B. Selby & Co. Pty. Ltd., has established the Selby Fellowship, a science award of £1,500 (Australian), or approximately $3,375.00. This fellowship is offered to any scientist at the doctorate level, in any country of the world, for one year's tenure at any Australian university or research establishment. The recipient's travel expenses to and from Australia will be paid by the Selby firm. The fellowship is to be administered by the Australian Academy of Science. For further information concerning this award, please address inquiries to: Secretary, Australian Academy of Science, Canberra, A.C.T., Australia.

• • •

Research center planned. Stauffer Chemical Co. has completed plans to build a major Research Center at Richmond, Calif., on a tract adjacent to the present Richmond plant and research laboratories. The new facilities will be used to expand process development and pilot plant activities. Construction of the first unit, a laboratory, begins this month and is to cost about $1.6 million, with completion scheduled for early 1961. The central building will be of a wing-type design, to facilitate future expansion and integration with other planned facilities. Aluminum, porcelain, and glass will be used extensively as functional and design elements. This first unit will include administrative offices, twenty laboratories for basic and applications research, library and auditorium, units for bench-scale process development, and the usual service facilities.

Atkins Award. Hoffman-LaRoche, Inc., Inc., is one of two industrial firms to receive the Atkins Award, presented annually by the New Jersey Science Teachers' Association in recognition of outstanding assistance in the development of more effective classroom science teaching.

Under the direction of Royal F. Earle, Jr., of its Industrial Relations Department, Hoffmann-LaRoche has carried on a broad program of cooperation with the schools. The aim is to help students see how industry operates, what careers lie ahead in the chemical and drug fields, and what new scientific contributions to better health can be hoped for. The program has included assistance to high school students entered in science fairs, supplying guest teachers and speakers on scientific subjects, participation in career day programs, and plant tours for high school and college groups. Also, various students have been helped with literature and answers to questions by mail. Hoffmann-LaRoche has participated for the past two years in the Summer Science Program of Glen Rock High School. The Roche Research Club this past year presented a Science Student Symposium in which five schools took part.

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Send resume and full details to Dept. 9, **CEREAL SCIENCE TODAY,** 1955 University Avenue, St. Paul 4, Minnesota.

BOOK reviews

Conversion Factors and Technical Data for the Food Industry. Compiled by C. G. Harrel and R. J. Thelen; Burgess Pub. Co., Minneapolis, 6th ed.; 1959. Price $20.00. Reviewed by J. W. EVANS, American Maize-Products Co., Roby, Indiana.

In this book a great amount of practical useful information has been collected which will continue to find use by all engaged in the various activities of the food field. The selection of subject matter could have been made only by authors who have had broad and successful experience in all phases of the food industry.

As is stated in the Foreword by George S. Pillsbury, "the book deals in great detail with the milling and baking fields — but it also contains much information applicable to most any type of food processing." It is the reviewer's belief that those not in the baking and milling fields also will find clear, accurate, easy-to-find information which will be used almost daily.

Organization and presentation of subject matter is unusual; the authors have interwoven with the factors and data descriptions and explanations which will be of great assistance to many who are getting into the particular area for the first time. This makes the book much more than a group of tables or a "handbook."

The index is well done and is very comprehensive. Areas of the data that have been checked by the reviewer have been found accurate and in sufficient detail to be very useful.

This book contains conversion factors, measurements and equivalents, various engineering data relating to plant equipment, operations and maintenance, analytical and physical data on foods and food ingredients, as well as Definitions and Standards of Identity for many items. Information of this type will be very helpful to chemists, engineers, food technologists, home economists, plant manice personnel, and others.
agers, plant operators, technical serv-

■ ■ ■ ■

Breeding Field Crops, by John Milton Poehlman. Henry Holt & Co., New York, 1959, 427 pp. Price $8.50. Reviewed by W. H. WADDELL, Ontario Agricultural College, Guelph, Ont.

This book is an elementary treatment of the subject of plant breeding for undergraduate students.

The material is basically sound and is presented in a manner that is readily understandable. The format is attractive, and practically every page carries an illustration or line drawing.

Professor Poehlman discusses the causes and extent of variation in plants in a manner that is wanting in most text books. The essential features of plant reproduction are adequately described and illustrated before breeding problems are discussed. The practical approach to these breeding problems should stimulate the interest of undergraduate students.

After an excellent introduction which deals adequately with reproduction in plants, genetics in relation to plant breeding and methods and techniques, there follow chapters on the breeding of each of the main crops — wheat, oats, barley, rice, flax, tobacco, soybeans, corn, sorghum, cotton, sugar beets, and forage crops, with a short chapter on seed-production practices.

As might be expected in a first edition, a few "slips" in English occur, but the text, in the opinion of the reviewer, is one of the most interesting that have reached our department in recent years and will be widely used by our teaching staff.

■ ■ ■ ■

A Modern Dynamic Approach to Product Development; 205 pp. Order from Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. (PB 151649) Price, $3.50.

How can product-development be managed to produce a new product, desired by a customer, by a date dictated by readiness for product utility and by the greatest conservation of engineering staff and money?

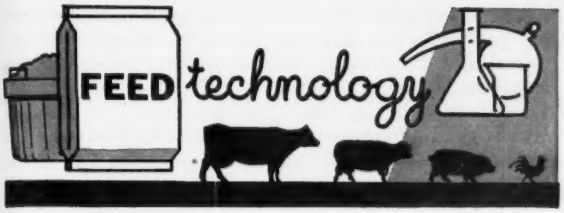
Considering today's research and development costs and the short life of new products as compared to a few years ago, Sidney Sobelman, chief of the Special Analysis Branch of the Army's Picatinny Arsenal, has attempted to lay out "A modern dynamic approach to product development" in a book of that title just published by the Office of Technical Services, U.S. Department of Commerce.

The book includes chapters on "The customer's needs (product characteristics)," "Product pay-off (profit) and the time factor," "Evaluation and selection of programs," "Forecasting and scheduling a program," "Forecasting and scheduling many programs (allocation of resources)," "The milieu or 'climate' for product development," "The organization — characteristics and structure," "Funds and the budget," and some speculation on "The future."

Mr. Sobelman's book is the result of a year of study under the Secretary of the Army's Research and Study Fellowship. "It is hoped," he writes, "that the basic considerations of elements of a product, of the time factor, of pay-off as a criterion, and of scheduling many projects among many service stations or teams will at least stimulate product development organizations to increase their profits and reduce costs and lead-times."

■ ■ ■ ■

CTR-357, Food Preservation by Irradiation, 1951–58, is a new catalog of technical Reports dealing with research and development in the field of radiation preservation of food, published by the Office of Technical Services, U.S. Dept. of Commerce.



NEWS AND ANNOUNCEMENTS

Feed Production School. The 1959 Feed Production School is over. Those who missed the three-day session will want to obtain a copy of the Proceedings. This includes all of the papers presented, complete with tables, photos, and slide material. Such subjects as quality control, premixing, and effects of feed formulation on pelleting production will be of interest to all feed chemists, nutritionists, and production personnel. Copies are now available at $15 each from Feed Production School, Inc., 20 West 9th St. Building, Kansas City 5, Missouri. The 1960 program committee is already hard at work and have announced that next year's school will emphasize grinding and mixing operations.

Feed Microscopy. The American Association of Feed Microscopists have announced the dates for their 1960 meeting. It will be held in San Antonio, Texas, at the Hilton Hotel on June 13-15. If you are not using feed microscopy yet, or want to improve your technique, this meeting is a *must.* Mark the dates on your calendar now. Keep watching this column for program details.

AOAC Meetings. This year's meeting of the Association of Official Agricultural Chemists in Washington was undoubtedly the most interesting to date. Those of you who could not attend may still be able to obtain a copy of the Official Program, which lists all of the papers presented, from the Association Secretary. The reports on feed sampling, proximate analyses, and vitamin A, antibiotic, and drug assay methods will be "required reading" for all feed chemists. Watch for forthcoming issues of the AOAC *Journal* for the complete published papers.

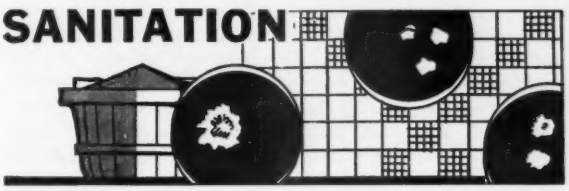
Vitamin A Tests. A comprehensive study of various vitamin A sources used in feeds was published recently by a Canadian group from Ontario Agricultural College. Their paper appeared in *Poultry Science 38:* 929–942 (July, 1959). The tests compared stability, chick growth, liver storage, mortality, etc. Their findings indicated the superiority of gelatin-stabilized vitamin A products.

Animal Science Meetings. The American Society of Animal Production concluded its 51st Annual Meeting in Chicago on November 28. Included on the program were several papers of interest to feed chemists and nutritionists, particularly in the field of analysis of animal carcasses for quality following feeding trials. New approaches using specific gravity, ultrasonic, photometric, and photographic techniques were described. A microbiological method for determining fat rancidity was also presented, as well as several methods for determining quality of roughages and forage crops. Many of these papers will be published in future issues of the *Journal of Animal Science.*

1960 AAFCO Book. The 1960 Official Publication of the American Association of Feed Control Officials is now available. Copies are obtainable at $5 each from R. T. Wetherbee, Treasurer, One Ivy Lane, Burlington, Vt. Those who have delayed ordering will want to get their 1960 copy of this important reference book immediately. Numerous changes in ingredient definitions and labeling, as adopted at the October AAFCO meetings in Washington, are published therein.

New Feed Composition Manual. A manual entitled "Joint United States-Canadian Tables of Feed Composition," Publication 659, has been announced by the National Academy of Sciences — National Research Council in Washington. Data are presented on proximate analyses, energy, vitamins, amino acids, etc. Some 700 concentrates and 1,000 roughages are covered. This should be extremely useful for the feed industry. Copies are available at $2 each from the Publications Office, National Academy of Sciences — National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

ROBERT C. WORNICK



ANNOUNCEMENT

The AOAC Refereeship on Extraneous Materials in Foods and Drugs has been divided between two Referees and into two distinct sections. One section, designated Extraction Methods for Extraneous Materials, will continue under Kenton L. Harris.

If you have followed the reports and publications in this area of work you know of the work done on the identification of insect fragments under the Associate Referee, O'Dean L. Kurtz. This basic work as projected several years ago is now essentially completed. However, in the field of sanitation and sanitation analyses and its relationship to food technology there yet remains considerable need for investigation and evaluation of the nature of insect infestation and its relationship to indices of contamination of a finished food product. With this in mind a new Refereeship, embracing the above subject, has been established under O'Dean L. Kurtz. The new title is *Analytical Entomology of Food and Drugs.*

Several Associate Referees are now being designated in connection with specific food products and their associated insect-sanitation problems.

If you are interested in the work on entomological problems of sanitation and contamination in foods and drugs, if you have specific areas in which you would like to investigate and would like to serve as the Associate Referee of this area, please contact, directly, Mr. O'Dean L. Kurtz, Division of Microbiology, Food and Drug Administration, Washington 25, D. C.

ERRATUM

Cereal Science Today, Vol. 4, No. 7
(September 1959 issue)

Page 223, Laboratory Helps and Gadgets — Notes on the Maltose Test:

Second column, last paragraph: Wherever "0.5*N* hypo" appears, please change to "0.02*N*."

AACC

LOCAL SECTIONS

Pacific Northwest Section's November News Letter gives an insight into activities of interest to its membership, in several meeting notices:

The Montana Wheat Quality Council met on November 6 at Great Falls. Betty Sullivan of Russell-Miller Milling Co., Minneapolis, was an out-Section guest.

The Oregon Wheat Growers League held its 32nd annual convention at Pendleton, December 3, 4, and 5.

Tuesday, January 12, is the tentative date for the Advisory Committee of the Western Wheat Quality Laboratory to hold their annual meeting. On the following day, the board of directors of the Pacific Northwest Crop Improvement Association will meet.

Program committee for the Section's annual meeting next June, at Bozeman, Montana, has been selected by Joe Shogan, chairman: Mark Barmore, Victor Evans, Martin Wise, and Harold Blain.

• • • •

Northwest Section, meeting on November 20, heard Robert A. Larsen of The Pillsbury Co. give his "Impressions of Russia," from his European trip last summer which included that country. He visited several institutions in Moscow – the Institute for Cereal Research, the Milling School, and the Institute for Bread Baking – and was shown their facilities. Dr. Larsen feels that his discussions with scientists in each place opened the way for continued profitable relations through correspondence and through visits of European scientists to this country.

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New York Section met on November 10, with Henry Brenner, president of the Home Testing Institute, Inc., as speaker; his subject was "Methods of evaluating the consumer acceptance of cereal products." Mr. Brenner outlined two methods of comparison used in market research: in "paired comparison," he said, product A is evaluated by checking directly against product B. In the second method samples are issued to comparable groups of people, product A to one group and product B to the other, with a questionnaire accompanying each. Evaluation is made through the reported answers, and interpretation of the results, according to Mr. Brenner, is the key to successful market research.

For the meeting on Dec. 8 at the Brass Rail Restaurant, the topic "Liquid sweeteners" was presented by Herman Saussele, Jr., of Anheuser-Busch, Inc., St. Louis, Mo.

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Central States Section met on November 13 at Belvedere Joe Restaurant, St. Louis. The occasion was one of the visits National President D. B. Pratt, Jr., is making to greet and get acquainted with local section members, and to convey his message on communications problems between management and personnel in quality control.

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Toronto Section's December meeting was the annual Christmas party, held at the Westbury Hotel. There were 110 present for buffet supper and dancing. Door prizes, contributed by Allied Trades, were outstanding. J. G. Hughes, of Chas. A. Smith, acted as chairman and is to be congratulated on an excellent job of organizing such a fine affair.

The next meeting will be on January 21 at the Red Path Sugar Refining works, with a tour of the new $18-million plant, officially opened by Queen Elizabeth during her summer tour.

New members are K. Klopp of Lever Bros.; W. S. Gilpin and W. David, Canada Packers, Montreal; K. Symons, C. A. Smith, Montreal; W. D. Thompson of Merck & Co., Inc.; R. Conovan of Maple Leaf Milling; and J. J. Stroz of Procter & Gamble.

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Pioneer Section met December 4 and 5 at the Lassen Hotel in Wichita, Kansas. The meeting got started off Friday evening when about 40 members toured, by bus, the Frontier Chemical Company's plant. On Saturday Howard Becker of the Nebraska Consolidated Mills of Omaha gave an account of his trip to Puerto Rico, showing some interesting and beautiful color slides. Following Mr. Becker's talk, S. C. Brennan, district manager of the Social Security Administration, Wichita, brought members up to date on aspects of the social security program.

After the luncheon, a plaque was presented to John Giertz of the Kansas Milling Co. (center in photo),

in appreciation of his efforts and contributions to the Pioneer Section, as well as assistance he has given to individual members. The presentation speeches were given by Elden Smurr and C. S. Sullivan. After-dinner speaker was Glenn Hargrave of The Paniplus Co., Kansas City, Mo., on the subject of fungal enzymes.

The meeting was well attended and there was considerable interest in all three talks, as evidenced by the questions and the lively discussion following each one.

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Niagara Frontier Section's December meeting (12th) was a Christmas party, with bowling, at Thruway Lanes in suburban Buffalo.

Well on the way to complete recovery by now, we trust, are Bert Baker of Maple Leaf Milling Co., Port Colborne, Ont., from a broken ankle; and Fred Randall of GLF Mills, from major throat surgery.

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Northern California Section: These details on Eugene Gwozdz's talk (given at the October meeting) came in just too late for the December issue: Speaking on milk and dairy products as related to baking, Mr. Gwozdz explained in detail the process of drying milk, stressing the points that most affect the product for use by the baker. He said that the sulfhydryl group, which is responsible for slackening the dough

in breadmaking, is destroyed or inactivated if the preheating step is properly carried out. He also discussed sodium caseinate and its use by the baker.

New members: Maura M. Rean, WURD Lab., Albany, Calif., and Jack E. Miller, Safeway, Bakery Div., San Jose, Calif.

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Midwest Section had its combined December meeting and Christmas party on the 7th. Members and wives made merry around the flowing eggnog bowl, and their enjoyment of a tasty meal was enlivened by singing the traditional Christmas carols and by the distribution of numerous worthwhile door prizes.

A colorful motion picture film on South America was shown and narrated by Ernest Guenther, vice-president and technical director of Fritzsche Bros. Inc. The film is a record of a 15,000-mile trip made by Dr. Guenther to survey the production of essential oils. Scenes from six countries show methods of growing, harvesting, and extracting plants that produce such oils as peppermint, methol, lemongrass, eucalyptus, and others. Much of the film includes scenic beauty of the Andes, the pampas, and the tropics, scenes and comments on customs of the people, and views of historic spots.

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Midwest Section. – Belated notes on R. L. Whistler's talk at the meeting on November 2: Dr. Whistler described the crop utilization research program at Purdue University, outlining work in the isolation and characterization of natural hemicellulose gums in crop residues; mechanism of the synthesis of starch and hemicellulose in wheat plants; electron-microscope studies of granule surfaces and cavitation in corn starch; the chemistry of hypochlorite oxidation of starch; and development and properties of high-amylose corn starch.

Thomas J. Schoch introduced a visitor from Germany, Dr. Helmuth Roederer, Maziena Werke, Hamburg.

More new members since last month are John A. Korth of Corn Products Co., Argo, Ill.; C. M. Hoskins, Glen R. Hoskins Co., Libertyville, Ill.; M. A. Friedman, Swift & Co., Chicago; and Robert A. Langan, Corn Products Co., Chicago.

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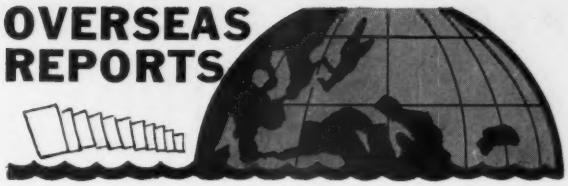

• • • Canada

Two new rust-resistant varieties of hard red spring wheat have just been approved by the Canada Department of Agriculture for general production in Western Canada. The varieties have been named CANTHATCH and PEMBINA and they are equal in quality to Marquis. Pembina was developed by the Rust Area Project Group from the cross Thatcher × R.L. 2564. The variety is slightly more resistant than Selkirk to stem and leaf rust and is a little earlier in maturity and similar in yield. Canthatch was developed by the Rust Area Project Group from the cross Thatcher[6] × Kenya Farmer for which six successive crosses of Thatcher were employed. The variety has the same resistance as Thatcher to the common races of stem rust and has additional resistance to certain virulent races including 15B. Except for this additional rust resistance it is virtually identical to Thatcher agronomically. Seed of these two varieties is now being distributed to farmers for spring sowing.

T. R. AITKEN

• • • India

An FAO Regional Seminar on Food Technology for Asia and the Far East was held August 1 to 8, at the Central Food Technological Research Institute, Mysore, India. Among those attending were representatives from different countries of the region and from international organizations, as well as leading Indian scientists and technologists.

Shri Ajit Prasad Jain, India's Minister for Food and Agriculture, inaugurated the session and spoke of the urgent food and nutrition problems of the region, which now contains more than half the population of the whole world. He emphasized the inadequacy of diets and the need for planned development of protective foods from materials already available in the region and others that can be produced easily within the region. One of the most urgent needs discussed by the session was a regional center for training and research which would start with the background of the conditions, facilities, and traditional practices and methods of the region. Samples of products representing traditional methods and developments were displayed.

For the occasion, the Institute brought out a special publication entitled "Some aspects of food technology in India." This contribution, while by no means exhaustive, has focused attention on some recent trends which offer scope for practical application, both in India and elsewhere.

V. SUBRAHMANYAN

Observations

In European cereal laboratories we find procedures and techniques quite different from our practices. To understand the reasons for these differences we must keep in mind that the Europeans are interested in the breadmaking potential of soft red winter wheat flours; from 60 to 100% of the flour used in bread production is made from soft wheat. In some countries the miller is required to use 60% soft red in his mill mix; in others, 80%, etc.

To measure blends of soft wheat flour with small percentages of hard wheat flour requires entirely different testing procedures. European chemists are measuring gluten quality in an entirely different area of gluten strength than chemists in the United States. Because of this they use many physical testing procedures that we find are of little value in our work with hard wheat flours. Dr. Pelshenke points out that the bake test is the most important of all their wheat quality tests.

The baking test most often used in Europe is one evolved by Dr. Pelshenke and his associates. The test uses 500 grams of flour, 15 grams yeast, 6 grams salt, and water on the basis of farinograph absorption when the top of the curve is centered on the 350 unit line. The dough is mixed one minute in low speed and one minute in high speed (the mixer has a very gentle mixing action). The doughs are weighed from the mixer and temperature is checked at 28°C. The doughs are fermented in a humidified cabinet at 28°C. for one hour with a hand punch at the end of the first 30 minutes. The dough is rounded into a ball and placed in a pan; it is cabinet-proofed about 60 minutes at 40°C. (Time is adjusted in proofing according to the judgment of the baker.) It is baked 30 minutes at 230°C. The bake pan dimensions are: top 13 x 13 cms., bottom 8 x 8 cms., and 11 cms. deep.

That's all for now.

Jim Doty

DOTY
Laboratories
1435 Clay St.,
North Kansas City 16, Mo.

FORMULATION SYMPOSIUM

February 26 and 27, Springfield, Illinois

Sponsored by the Central States Section of the AACC

"Ingredient Relationships in Baked Goods" will be the subject of a symposium sponsored by the AACC's Central States Section. The symposium will be held in Springfield, Illinois on February 26 and 27. Authorities on each of the main ingredients used in baked goods will pool their knowledge in a two-day session which will include:

- Formal presentations
- Panel discussion with participation from the floor
- A tour of the Pillsbury mix plant in Springfield
- Evening social activities
- A ladies' program

An open invitation is extended to all AACC members and other interested parties in the cereal industry. Bring the wives! A special program is being planned for them during the technical sessions.

Registration material is available through any AACC Local Section chairman or by writing: John T. Watson, Anheuser-Busch, Inc., Dried Yeasts and Derivatives Dept., 7th & Pestalozzi St., St. Louis 18, Mo.

— PROGRAM —

February 26

Registration: 1-3 p.m.

Business Meeting: 1:30-2 p.m. — Central States Section

Technical Program: 2-6:15 p.m.

WELCOME — Speaker to be Announced
OPENING REMARKS — A. R. Handleman, Chairman, Central States Section
FLOUR AND SUGAR — Speaker to be Announced
SHORTENING — C. J. Harrer, Anderson-Clayton Co.
EGGS — R. H. Forsythe, Henningsen, Inc.
YEAST — R. D. Seeley, Anheuser-Busch, Inc.
CHEMICAL LEAVENING — J. F. Conn, Monsanto Chemical Co.
MILK — Speaker to be Announced
WHEY — E. A. Alesch, Western Condensing Co.

Evening Activities: Cocktails and Dinner Dance, 7:45-12 midnight.

February 27

Technical Program: 9-11 a.m.

PANEL FORUM — Moderated by J. C. Gray, Pillsbury Co.
OPEN FORUM — Participation from the Floor

Tour of Pillsbury Mix Plant: 11:15-12 noon

Luncheon: 12:30 p.m.

Adjournment

LADIES' PROGRAM

February 26

2-6 p.m. — Tour of points of interest in and around Springfield with emphasis on historical associations with Abraham Lincoln

February 27

11-12 noon — Tour of Pillsbury Mix Plant with members
12:30 p.m. — Luncheon with members